PATENT ABSTRACTS OF JAPAN

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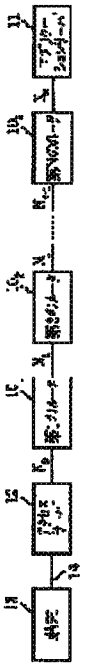
(54) NETWORK SYSTEM



(57)Abstract:

PROBLEM TO BE SOLVED: To provide a network system that can easily be applicable to an existing network and realizes optimum data transfer by recognizing a band of a channel between a terminal and an access server.

SOLUTION: An application server 11 contained in a network consisting of interconnected networks N0-NN by 1st to N-th routers 101-10N transmits a 1st echo request to a terminal 13 connected to an access server 12 via a channel 14 to measure a round trip time RTT1 up to the terminal 13 and estimates number of routers in existence between the application server 11 and the access server 12. Then the application server 11 transmits a 2nd echo request to measure a round trip time RTT2 up to the access server 12. As a result, the application server 11 can recognize a data delay time (t) of the channel 14 and estimates a channel band of the channel 14 corresponding to the delay time (t).

CLAIMS

[Claim(s)]

[Claim 1]A network system comprising:

A channel which has a predetermined zone.

A terminal which is connected to this channel and receives data via said channel.

The 1st device that relays transmitted and received data between said terminals while accommodating said terminal via said channel.

The 2nd device that transmits data to said terminal via said 1st device according to a zone of said channel presumed based on data delay time of said channel.

[Claim 2]A network system comprising:

A channel which has a predetermined zone.

A terminal which is connected to this channel and receives data via said channel.

The 1st device that relays transmitted and received data between said terminals while accommodating said terminal via said channel.

The 1st measurement means that is connected to said 1st device and measures the 1st round-Trip Time as data delay time between said terminals, The 2nd measurement means that measures the 2nd round-Trip Time as data delay time between said 1st device, A channel delay calculating means which computes data delay time of said channel from the 1st and 2nd round-Trip Time measured by the 1st and 2nd measurement means, A channel zone memory measure a zone of said channel is remembered to be corresponding to data delay time of said channel, The 2nd device provided with a data sending means which transmits data to said terminal according to a zone of said channel memorized by this channel zone memory measure corresponding to said data delay time computed by said channel delay calculating means.

[Claim 3]A network system comprising:

A terminal which transmits an echo response to which a predetermined counter value was set to the transmitting origin corresponding to an echo request defined beforehand.

While accommodating said terminal via said channel and relaying transmitted and received data and said echo request between said terminals, An access server which transmits an echo response to transmitting origin of said echo request when a counter value included in said echo request whenever it relays said echo request is subtracted and it becomes zero.

While being connected to this access server and relaying transmitted and received data and an echo request between said terminals, 1 which transmits an echo response to transmitting origin of said echo request when a counter value included in said echo request whenever it relays said echo request is subtracted and it becomes zero, or two or

more routers.

The 1st echo request transmitting means that is connected to any one of said the routers, and transmits the 1st echo request to said terminal, The 1st echo response reception means that receives the 1st echo response from said terminal corresponding to this 1st echo request, The 1st measurement means that measures lapsed time after transmitting said 1st echo request until it receives said 1st echo response as the 1st round-Trip Time as data delay time between said terminals, An estimation means which presumes the number of routers from a counter value of said 1st echo response received by said 1st echo response reception means to said access server, The 2nd echo request transmitting means to which said number of routers presumed by this estimation means transmits the 2nd echo request set as counted value to said terminal, The 2nd echo response reception means that receives the 2nd echo response corresponding to this 2nd echo request, The 2nd measurement means that measures lapsed time after transmitting said 2nd echo request until it receives said 2nd echo response as the 2nd round-Trip Time as data delay time between said access servers, A channel delay calculating means which computes data delay time of said channel from the 1st and 2nd round-Trip Time measured by said 1st and 2nd measurement means, A channel zone memory measure a zone of said channel is remembered to be corresponding to data delay time of said channel, An application server provided with a data sending means which transmits data to said terminal according to a zone of said channel memorized by this channel zone memory measure corresponding to data delay time of said channel computed by said channel delay calculating means.

[Claim 4]The network system comprising according to claim 3:

An echo response discriminating means from which said 2nd echo response by which said application server was received by said 2nd echo response reception means distinguishes whether it is transmitted with said terminal.

It is that to which said 2nd echo response was transmitted by this echo response discriminating means with said terminal. A resending control means to which a value smaller than said number of routers presumed by said estimation means when it was and was distinguished makes the 2nd echo request set as counted value transmit by said 2nd echo request transmitting means to said terminal.

[Claim 5]Said application server transmits data to said terminal according to a zone memorized by this channel zone memory measure corresponding to this when it is beyond a threshold data delay time of said channel computed by said channel delay calculating means was beforehand decided to be, The network system according to claim 3 or 4 provided with a data sending means which transmits data to said terminal in a

maximum band of a communication path between said terminals when data delay time of said channel is smaller than a threshold decided beforehand.

[Claim 6]The network system comprising according to claim 3 to 5:

A connection-request transmitting means which transmits a connection request to said application server before said terminal receives data from said application server.

It has a response means which receives connection recognition received corresponding to this connection-request transmission as said 1st echo request, and transmits a response corresponding to this as said 1st echo response, A transmitting means which transmits said connection recognition corresponding to said connection request to which said application server was transmitted by said connection-request transmitting means as said 1st echo request.

A channel setting-out means to set up a channel between said terminals while receiving said response transmitted by said response means as said 1st echo response.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the network system which accommodates the terminal which receives data transmitting from the server on a network via a circuit with respect to the network system which receives the various data on a network from a terminal in detail.

[0002]

[Description of the Prior Art]Various services, such as distribution of an E-mail, Net News and video, and voice data and a video conference system, have come [in recent years / the Internet by which the computer network was connected mutually spreads quickly, and] to be provided. Offer of such various services is largely based on highly-efficient-izing of a computer, and progress of network communication art. The terminal for using this is also diversified as various services spread. The domestic personal computer which passed the conventional general telephone line as such a terminal, for example, There are an information personal digital assistant (Personal Digital Assistants:PDA) through the computer in the office through the dedicated line of the broadband or the wireless communications lines of the narrow-band and a personal digital assistant called a cellular phone.

[0003]When using the various services on the Internet at these terminals, it is necessary to set up the channel between a terminal and the application server which

provides the various services on the Internet. Under the present circumstances, setting out of a communication band is performed, the resource in a network is used effectively, and various service information is transmitted from an application server so that service can be comfortably received by the terminal side which receives service provision.

[0004]It is necessary to recognize the zone of the circuit between an application server and a terminal for setting out of a communication band. Therefore, in the conventional network system, bandwidth information is notified, for example from a terminal to an application server, and transmission of various service information is performed from the application server to the channel set up according to this. In addition, the network system which applied the art indicated by JP,11-112543,A "data communication method and its repeating installation", In the repeating installation which memorized the communication band beforehand set up for every communication identification information, the communication band according to the communication identification information of the received relay data is secured in order to perform data transfer using the optimal zone similarly. Thereby, bandwidth information is not notified but mounting of still more specific band securing pro TOKORORU is made unnecessary.

[0005]

[Problem(s) to be Solved by the Invention]However, in the conventional network system which notifies bandwidth information in advance of a communication start. Since it is necessary to mount the additional equipment for notifying bandwidth information in a terminal, there is a problem that the same function as all a variety of terminals not only of barring the small weight saving of a personal digital assistant but the existing Internet system must be made to have.

[0006]It is actually difficult to apply the art indicated by JP,11-112543,A to the network which constitutes the existing Internet. It is because it is necessary to introduce not only in a specific network but in all the networks especially when interconnection of the various networks is carried out like the Internet.

[0007]By the way, when its attention is paid about the various networks by which interconnection was carried out like the Internet, each communication band is a broadband. The circuit between that terminal mentioned above on the other hand and the access server accommodated in the Internet in order to connect with this terminal is a narrow-band. Therefore, it depends on the zone of the circuit between a terminal and an access server for the zone of the communication line set up between an application server and a terminal in many cases. That is, if the zone of the circuit between this terminal and access server can be recognized, the resource in a network will be utilized

effectively, and transmission of various service information will be attained from an application server so that service can be comfortably received by the terminal side which receives service provision.

[0008]Then, the purpose of this invention is to provide the network system which can apply to the existing network easily, recognizes the zone of the circuit between a terminal and an access server, and realizes optimal data transfer.

[0009]

[Means for Solving the Problem]a channel which has a (b) predetermined zone in the invention according to claim 1, and (**) -- with a terminal which is connected to this channel and receives data via a channel. (**) The 1st device that relays transmitted and received data between terminals while accommodating a terminal via a channel, (**) Make a network system possess the 2nd device that transmits data to a terminal via the 1st device according to a zone of a channel presumed based on data delay time of a channel.

[0010]With namely, a network system provided with the 1st device that accommodates a terminal in the invention according to claim 1 via a channel which has a predetermined zone, and the 2nd device connected to this. He is trying for the 2nd device to transmit data to a terminal according to a zone of a channel presumed based on data delay time of a channel connected to a terminal.

[0011]a channel which has a (b) predetermined zone in the invention according to claim 2, and (**) -- with a terminal which is connected to this channel and receives data via a channel. (**) The 1st device that relays transmitted and received data between terminals while accommodating a terminal via a channel, (**) The 1st measurement means that is connected to the 1st device and measures the 1st round-Trip Time as data delay time between terminals, The 2nd measurement means that measures the 2nd round-Trip Time as data delay time between the 1st device, A channel delay calculating means which computes data delay time of a channel from the 1st and 2nd round-Trip Time measured by the 1st and 2nd measurement means, A channel zone memory measure a zone of a channel is remembered to be corresponding to data delay time of a channel, A network system is made to possess the 2nd device provided with a data sending means which transmits data to a terminal according to a zone of a channel memorized by this channel zone memory measure corresponding to data delay time computed by channel delay calculating means.

[0012]That is, in the invention according to claim 2, data delay time of a channel was computed from the 2nd device, the 1st round-Trip Time to a terminal, and the 2nd round-Trip Time to the 2nd device and 1st device. He establishes a channel zone

memory measure a zone of a channel was beforehand remembered to be corresponding to data delay time of a channel, and is trying for the 2nd device to transmit data to a terminal according to a zone of a channel memorized by this channel zone memory measure corresponding to computed data delay time.

[0013]the invention according to claim 3 -- (b) -- with a terminal which transmits an echo response to which a predetermined counter value was set to the transmitting origin corresponding to an echo request defined beforehand. (**) While accommodating a terminal via a channel and relaying transmitted and received data and an echo request between terminals, An access server which transmits an echo response to transmitting origin of an echo request when a counter value included in an echo request whenever it relays an echo request is subtracted and it becomes zero, (**) While being connected to this access server and relaying transmitted and received data and an echo request between terminals, 1 or two or more routers which transmit an echo response to transmitting origin of an echo request when a counter value included in an echo request whenever it relays an echo request is subtracted and it becomes zero, (**) The 1st echo request transmitting means that is connected to any one of the routers, and transmits the 1st echo request to a terminal, The 1st echo response reception means that receives the 1st echo response from a terminal corresponding to this 1st echo request, The 1st measurement means that measures lapsed time after transmitting the 1st echo request until it receives the 1st echo response as the 1st round-Trip Time as data delay time between terminals, An estimation means which presumes the number of routers from a counter value of the 1st echo response received by the 1st echo response reception means to an access server, The 2nd echo request transmitting means to which the number of routers presumed by this estimation means transmits the 2nd echo request set as counted value to a terminal, The 2nd echo response reception means that receives the 2nd echo response corresponding to this 2nd echo request, The 2nd measurement means that measures lapsed time after transmitting the 2nd echo request until it receives the 2nd echo response as the 2nd round-Trip Time as data delay time between access servers, A channel delay calculating means which computes data delay time of a channel from the 1st and 2nd round-Trip Time measured by the 1st and 2nd measurement means, A channel zone memory measure a zone of a channel is remembered to be corresponding to data delay time of a channel, A network system is made to possess an application server provided with a data sending means which transmits data to a terminal according to a zone of a channel memorized by this channel zone memory measure corresponding to data delay time of a channel computed by channel delay calculating means.

[0014]With namely, a network system provided with an access server which accommodates a terminal in the invention according to claim 3 via a channel which has a predetermined zone, and an application server connected to this. He is trying for an application server to transmit data to a terminal according to a zone of a channel presumed based on data delay time of a channel connected to a terminal. Data delay time of a channel connected to a terminal measures the 1st round-Trip Time by transmitting the 1st echo request from an application server, and receiving the 1st echo response that a terminal which received this replied by an application server. In a terminal of a transmitting agency, a counter value subtracted whenever it passes an access server in a communication path between an access server and an application server which accommodate a terminal and 1, or two or more routers is set to the 1st echo response. Then, an application server transmits this to a counter value of the 2nd echo request while it presumes an initial value of a counter value set up by the terminal side and computes the number of routers from an application server to an access server from the 1st received echo response. And since the 2nd round-Trip Time from an access server to an application server is measurable by receiving the 2nd echo response corresponding to this, data delay time of a channel connected to a terminal as a result can be observed.

[0015]In the invention according to claim 4, with the network system according to claim 3, an application server, An echo response discriminating means which distinguishes whether the 2nd echo response received by the 2nd echo response reception means is transmitted with a terminal, It is that to which the 2nd echo response was transmitted by this echo response discriminating means with a terminal. When it was and is distinguished, a value smaller than the number of routers presumed by an estimation means is characterized by having a resending control means to which the 2nd echo request set as counted value is made to transmit by the 2nd echo request transmitting means to a terminal.

[0016]Namely, in the invention according to claim 4 in an application server. When it is made to distinguish and it is distinguished that it is a thing from a terminal, whether the 2nd echo response is a thing from a terminal, Since there are few routers of a course from an application server to a terminal than the number of routers of a course from a terminal to an application server, The presumed number of routers judges it as an error, measures the 2nd round-Trip Time again by the 2nd echo request set as an initial value of a counter value in a smaller value by a resending control means, and estimation precision of a zone of a channel connected to a terminal judged eventually is raised.

[0017]In the invention according to claim 5, with the network system according to claim

3 or 4, an application server, According to a zone memorized by this channel zone memory measure corresponding to this when it is beyond a threshold data delay time of a channel computed by channel delay calculating means was beforehand decided to be, data is transmitted to a terminal, When data delay time of a channel is smaller than a threshold decided beforehand, it is characterized by having a data sending means which transmits data to a terminal in a maximum band of a communication path between terminals.

[0018]Corresponding [namely,] to a zone memorized by channel zone memory measure when it is beyond a threshold computed data delay time was beforehand decided to be in the invention according to claim 5, Since data is transmitted from an application server to a terminal and it was made to make it transmit except [its] in a maximum band, Processing of an application server is simplified, and when a circuit which network congestion tends to generate is a narrow-band, while performing efficient data transfer, when a circuit is a broadband, data can be received comfortably also for a terminal.

[0019]In the invention according to claim 6, with the network system according to claim 3 to 5, a terminal, A connection-request transmitting means which transmits a connection request from an application server to an application server before receiving data, It has a response means which receives connection recognition received corresponding to this connection-request transmission as the 1st echo request, and transmits a response corresponding to this as the 1st echo response, A transmitting means which transmits connection recognition corresponding to a connection request to which an application server was transmitted by connection-request transmitting means as the 1st echo request, While receiving a response transmitted by response means as the 1st echo response, it is characterized by having a channel setting-out means to set up a channel between terminals.

[0020]Namely, when connection processing which sets up a channel in the invention according to claim 6 before transmitting data from an application server to a terminal is performed by the 3 direction hand shake, By making a connection recognition packet of an application server to a connection request from a terminal into the 1st echo request, and processing a response to an application server from a terminal as the 1st echo response further, Since a packet transmitted and received in a network can be reduced, improvement in a throughput can be aimed at.

[0021]

[Embodiment of the Invention]

[0022]

[Example]This invention is explained in detail per example below.

[0023]Drawing 1 expresses the outline of the composition of the network system in one example of this invention. As for the network system in this example, two or more network N_0 - N_N are connected via the 1st - the Nth router $10_{the\ 1}$ - 10_N, respectively. The 1st - the Nth router $10_{the\ 1}$ - 10_N, In the network layer of an open systems interconnection (Open Systems Interconnection:OSI) basic reference model, relay processing of the packet data transmitted between the networks connected is performed, respectively. Various network equipment, such as a computer, is connected to network N_0 - N_N. Here, the application server 11 which stores the contents data as service information for providing various services is connected to network N_N.

[0024]In order to acquire the contents data which accesses the Internet constituted by network N_0 - N_N, and is stored in the application server 11, a terminal, It is necessary to connect via the access server which connects with either direct network N_0 - N_N like the application server 11, or is accommodated in either network N_0 - N_N. When connecting with either direct network N_0 - N_N, a terminal will be accommodated in a network for exclusive use, and will be connected to network N_0 - N_N via a router. On the other hand, when connecting via an access server, a terminal will be connected to an access server via the general telephone line and wireless communications lines which are very narrow-band circuits as compared with a network for exclusive use. From personal digital assistants, such as a domestic personal computer, PDA, and a cellular phone, the Internet is accessed via an access server. In the network system in this example. The access server 12 shall be accommodated in network N_0, and the terminal 13 shall be connected with the access server 12 via the circuits 14, such as the public telephone network and cellular network of a between, and a PHS (Personal Handy-phone System) network.

[0025]A peculiar address is given and such 1st [**] - Nth router 10_1-10_N, the application server 11, the access server 12, and the terminal 13 of each other can be identified now, respectively.

[0026]In the network system in this example.The circuit 14 between the access server 12 and the terminal 13 among the communication paths between the application server 11 and the terminal 13, the zone of this circuit 14 can be presumed now paying attention to it being markedly alike as compared with other route portions, and the communication band between the application server 11 and the terminal 13 being dependent on the zone of the circuit 14 between the access server 12 and the terminal 13, since the zone is narrow as mentioned above. That is, since the zone of the circuit 14 is equivalent to the data delay time of the circuit 14, it observes the data delay time of the circuit 14 from the echo request transmitted from the application server 11, and the

echo response replied with each network equipment corresponding to this. And the application server 11 presumes the zone of the circuit 14 according to the data delay time of the observed circuit 14, and transmits the contents data demanded from the terminal 13 based on this presumed zone. It makes it possible to use the resource of network N_0 - N_N effectively, and to receive contents data comfortably at the terminal 13 by this.

[0027]Drawing 2 expresses the outline of the composition of the data transmitted and received by network N_0 in this example - N_N. That is, the echo request, the echo response, and contents data which are transmitted and received by network N_0 - N_N constitute IP (Internet Protocol) packet data shown in the figure (a), respectively. IP packet data 20 comprise the IP header field 21 where the various control information for disassembly of data, and an assembly and communication-path control is arranged, and the IP data field 22 by which it is decomposed and the packet-ized data which should communicate is arranged. The counter field 23 where the counter value the IP header field 22 indicates the number of routers which can be passed to be as shown in the figure (b) is arranged, It has the transmission source address 24 with which the peculiar address given to the network equipment of the transmitting agency is arranged, and the destination address 25 with which the peculiar address given to the network equipment of the address is arranged.

[0028]In for example, the case of the IP packet data transmitted to terminal 13 from the application server 11. To a transmission source address in the address of the application server 11, and a destination address The address of the terminal 13, The contents data which should be transmitted is arranged at the counter value of the grade which does not stagnate in the counter field within network N_0 - N_N over a long time by a certain cause, and IP data field, respectively. The counter value of the counter field is a transmitting agency, and after an initial value is set up, in a router or an access server, whenever these IP packet data pass, it subtracts "1" every, and it discards the IP packet data themselves, without acting as intermediary, when set to "0."

[0029]The composition as the IP packet data which carried contents data also with same echo request and echo response that were mentioned above is made. However, the control message of the Internet control message protocol (below Internet Control Message Protocol: abbreviates to ICMP.) is arranged at IP data field. In the control message of this ICMP, IP packet data can identify an echo request or an echo response now, and the application server 11 puts in the suitable initial value for the counter field of an echo request, and transmits to the terminal used as an address. An echo response is replied, when a counter value is set to "0" with a router or an access server before

reaching a terminal. When the terminal which is an address is reached, the echo response which put in the suitable initial value for the counter field similarly is replied.

[0030]The important section of the network system in this example which transmits and receives such an IP data packet and presumes the zone of the circuit 14 between the access server 12 and the terminal 13 hereafter is explained.

[0031]Drawing 3 expresses the composition important section of the terminal 13 in this example concerning the zone estimation control of the circuit 14 mentioned above. The line interface (below Interface: abbreviates to IF.) 30 which accommodates the circuit by which this terminal 13 is connected to the access server 12, The packet treating part 31 which performs an assembly and decomposition of the IP packet data transmitted and received via the circuit 14 between the access servers 12, The network connection treating part 32 for setting up the application server 11 and channel on the Internet constituted by network N_0 - N_N via the access server 12, It has the echo request treating part 33 which replies an echo response corresponding to the echo request from the application server 11.

[0032]The terminal 13 of such composition is a gestalt of the IP packet data shown in drawing 2, While acquiring contents data via the channel which required setting out and was set up in the channel with the application server 11, an echo response is replied corresponding to the echo request from the application server 11. The terminal 13 has a central processing unit (below Central Processing Unit: abbreviates to CPU.) which is not illustrated.

Various control mentioned above can be performed now based on the control program stored in predetermined memory storage.

[0033]Drawing 4 expresses the outline of connection processing of the channel between the application servers 11 performed at the terminal 13 in this example before acquiring contents data. Here, the circuit 14 between the terminal 13 and the access server 12 shall already be set up. In order to acquire [the terminal 13] contents data by the network connection treating part 32, when starting connection processing of the channel between the application servers 11 (step S40:Y), The connection request packet of the IP-packet-data composition shown in drawing 2 by the packet treating part 31 is generated (Step S41). As for this connection request packet, the data which the address of the terminal 13 and the application server 11 shows a connection request at IP data field is arranged in the transmission source address and the destination address, respectively. The counter value canceled to such an extent that it does not stagnate in a network by a certain cause for a long time is arranged in the counter field. Then, this connection request packet is transmitted from circuit IF30 to the access server 12 via

the circuit 14 (Step S42).

[0034]The access server 12 will relay this to the communication path beforehand set up with reference to the destination address at least, if the connection request packet from the terminal 13 is received.

[0035]The terminal 13 supervises reception of the connection recognition packet which shows the connection recognition from the application server 11 of the connection-request point by the packet treating part 31 corresponding to this connection request packet after transmission of a connection request packet (step S43:N), When this is detected (step S43:Y), the response packet which checks reception of connection recognition is generated (Step S44). As for the connection response packet, the data which the address of the application server 11 and the terminal 13 shows a connection response at IP data field is arranged in the transmission source address and the destination address, respectively. The counter value canceled to such an extent that it does not stagnate in a network by a certain cause for a long time is arranged in the counter field. As for the response packet, the data which the address of the terminal 13 and the application server 11 shows the response to connection recognition at IP data field is arranged similarly in the transmission source address and the destination address, respectively. The counter value canceled to such an extent that it does not stagnate in a network by a certain cause for a long time is arranged in the counter field. The terminal 13 transmits such a response packet to the access server 12 via the circuit 14 (Step S45), and ends a series of processings.

[0036]If the channel between the application servers 11 is set up according to the connection request from such a terminal 13, an echo request will be first transmitted to terminal 13 from the application server 11.

[0037]Drawing 5 expresses the outline of echo response processing of the terminal 13 in this example. Namely, the terminal 13 is the echo request treating part 33, and supervises reception of the echo request from the application server 11 (step S50:N), When it detects that it is an echo request from the control message of ICMP of IP data field of IP data packet which received (step S50:Y), In a destination address, the address of the application server 11 arranged in the transmission source address, In a transmission source address, the echo response which has arranged the data in which it is shown that it is an echo response in the control message of ICMP about the address of the terminal 13 at IP data field, respectively is generated (Step S51). Under the present circumstances, the counter value which consists of several bits currently assigned is arranged in the counter field to such an extent that it does not stagnate in a network by a certain cause for a long time. Usually, since the number of routers passed between the

terminal 13 and the application server 11 is 30 or less, as for the counter field, 5 bits or more are assigned. Therefore, numerical values which are easy to guess, such as "32", "128", or "255", are used for the initial value of a counter value.

[0038]Thus, the generated echo response is again transmitted from the packet treating part 31 to the access server 12 via the circuit 14 (Step S52). In the access server 12, when the echo response from the terminal 13 is received, this will be relayed to the communication path beforehand set up with reference to the destination address at least.

[0039]Then, access server 12 and 1st [**] - Nth router 10_1-10_N is explained. However, since the portion which these require for the line estimation control in this example is substantially the same, below, the access server 12 is explained.

[0040]Drawing 6 expresses the composition important section of the access server 12 in this example concerning the zone estimation control of the circuit 14. Circuit IF60 which accommodates the circuit 14 by which the access server 12 is connected to the terminal 13, Network IF61 which has an interface function with network N_0, The packet transfer section 62 which performs relay processing of the IP packet data between the circuit 14 and network N_0, It has the counter treating part 63 which distinguishes whether data is discarded based on the counter value of the counter field of the IP packet data relayed, or an echo response is performed, and the echo treating part 64 which performs echo response processing based on the discriminated result of the counter treating part 63.

[0041]The application server 11 of such composition has CPU which is not illustrated. Various control mentioned above can be performed now based on the control program stored in predetermined memory storage.

[0042]Drawing 7 expresses the outline of the packet relay processing of the application server 11 in this example. In the packet transfer section 62 of the application server 11. When reception of IP packet data is supervised via circuit IF60 or network IF61 (step S70:N) and this is detected (step S70:Y), by the counter treating part 63. Only "1" subtracts the counter value of the counter field of the received IP packet data (Step S71). Next, it is distinguished whether the counter value of this subtracted counter field is "0" (Step S72), When it is distinguished that a counter value is "0" (step S72:Y), with reference to IP data field of IP packet data which received, it is distinguished whether it is an echo request or it is the usual IP packet (Step S73).

[0043]When it is distinguished that the received IP packet data are echo requests (step S73:Y), the echo treating part 64 is made to generate an echo response here (Step S74). Furthermore, the echo treating part 64 turns the echo response which has arranged the

transmission source address of the received echo request to the destination address to a destination address by the packet transfer section 62, makes it reply (Step S75), and ends a series of processings (end).

[0044]The IP packet data received at Step S73 are not echo requests, For example, when it is distinguished that they are the usual packet data which carried the contents data from the application server 11 (step S73:N), it discards, without relaying packet data (Step S76). Under the present circumstances, to the transmitting origin specified with the transmission source address of the packet data to discard, that notice of abandonment is performed and a series of processings are ended (end). In this example, it sends a reply as an echo response also about this notice of abandonment.

[0045]When the counter value of the counter field of the received IP packet data was not "0" and it is distinguished at Step S72 (step S72:N), by the packet transfer section 62. To the address arranged in the destination address of the echo request, packet data are made to transmit (Step S77), and a series of processings are ended (end).

[0046]Since the composition of the important section concerning the line estimation control in this example of the 1st - the Nth router $10_{the\ 1}$ - 10_N is the same as the important section composition of the access server 12 shown in drawing 6, explanation is omitted. However, the 1st - the Nth router $10_{the\ 1}$ - differ from 10_N in that it has an interface function of the network which is not provided with circuit IF60, instead is connected via network IF. Since it is the same as that of operation of the access server 12 shown in drawing 7 also about operation of the important section concerning the line estimation control in this example of the 1st - the Nth router $10_{the\ 1}$ - 10_N, explanation is omitted.

[0047]Then, the application server 11 is explained.

[0048]Drawing 8 expresses the composition important section of the application server 11 in this example concerning the zone estimation control of the circuit between the terminal 13 and the access server 12. Network IF80 in which this application server 11 has an interface function with network N_N, The packet treating part 81 which performs an assembly and decomposition of the IP packet data transmitted and received between network N_N, The network connection treating part 82 for setting up the channel between the terminals 13 via the access server 12 accommodated in the Internet constituted by network N_0 - N_N, The echo treating part 83 which performs transmission of an echo request, and reception of an echo response to the terminal 13, Round-Trip Time which is the data delay time of the transmission time and the receipt time of the echo request by the echo treating part 83, and an echo response to a channel (below Round TripTime:.) It abbreviates to RTT. It has the RTT calculation processing part 84

to compute, the estimating part 85 which presumes the zone of the circuit 14 based on the processing result of the echo treating part 83 and the RTT calculation processing part 84, and the table 86 where the various decision criteria for presuming the zone of the circuit 14 by the estimating part 85 were memorized.

[0049]If the channel between the terminals 13 is set up by the network connection treating part 82, the application server 11 of such composition will transmit an echo request to the terminal 13, and will wait for reception of the echo response from the terminal 13 corresponding to this. Reception of an echo response will compute RTT of the channel set up by the network connection treating part 82 as RTT_1 from the transmission time of an echo request, and the receipt time of an echo response by the RTT calculation processing part 84. Although round-Trip Time is measured from the transmission time of an echo request, and the receipt time of an echo response, the time check of a timer is made to start at the time of transmission of an echo request, and it may be made to stop the time check of a timer here at the time of reception of an echo response. What is necessary is in short, just to be able to recognize lapsed time after an echo request is transmitted until an echo response is received.

[0050]Next, the initial value of the counter value of the counter field set up by the estimating part 85 from the counter value of the counter field of the received echo response at the terminal 13 which is a transmitting agency is presumed. Thereby, the number of routers between the application server 11 and the terminal 13 can be specified. Then, the application server 11 is transmitting an echo request to the access server 12 arranged at the preceding paragraph of the terminal 13 by the echo treating part 83, RTT of the channel between the application server 11 and the access server 12 can be recognized as RTT_2. Therefore, if data delay time of the circuit 14 is set to t, it can be shown like the following (1) type.

[0051]

$t = RTT_1 - RTT_2 \ldots (1)$

[0052]The application server 11 judges whether the circuit 14 is a narrow-band circuit or it is a broadband circuit from the data delay time computed according to (1) type. When judged with it being a broadband circuit, the maximum communication band of the communication path to the terminal 13 is set up, and contents data is transmitted. When judged with the circuit 14 being a narrow-band circuit, the communication band corresponding to data-delay-time t of the circuit 14 is set up, and contents data is transmitted.

[0053]Therefore, the application server 11 equips the table 86 with the following 1st and the 2nd judging standard table, and is taken as the decision criterion for zone

presumption of a circuit.

[0054]Drawing 9 expresses the outline of the composition of the 1st judging standard table for judging whether the circuit 14 is a narrow-band circuit or it is a broadband circuit. The result which should be judged is defined corresponding to RTT_2 in which this 1st judging standard table 90 is RTT between data-delay-time t of the circuit 14, and the application server 11 and the access server 12. Data-delay-time t of the circuit 14 and RTT_2 are binary-ized with "large" and "smallness", respectively. Here, when the packet size of an echo request is around 100 bytes, "smallness" is made smaller than 100 ms for "large" more than 100 millisecond ([ms]).

[0055]That is, data-delay-time t of the circuit 14 judges that RTT_2 is connected in 100 ms or more ("large"), and the circuit 14 is connected by the narrow-band circuit when smaller ("smallness") than 100 ms. Data-delay-time t of the circuit 14 with a value ("smallness") smaller than 100 ms. When RTT_2 is 100 ms or more ("large"), the circuit 14 is connected by a broadband circuit, and since the distance to the access server 12 is far, it is judged as what is connected from the network which the terminal 13 left. Data-delay-time t of the circuit 14 judges the circuit 14 to which the terminal 13 is connected to be a narrow-band circuit, although it is distantly separated also from RTT_2 of the distance to the access server 12 in 100 ms or more ("large") at the time of 100 ms or more ("large"). Data-delay-time t of the circuit 14 with a value ("smallness") smaller than 100 ms. As for RTT_2, the circuit 14 is connected by a broadband circuit at the time of a value ("smallness") smaller than 100 ms, Since the difference of the time delay to the terminal 13 and the time delay to the access server 12 is small and the distance to an access server is near, the terminal 13 judges it as what is connected from the neighboring network.

[0056]On the other hand, the 2nd judging standard table is a judging standard table for specifying the zone of the circuit 14 in order to transmit contents data by the optimal zone from the application server 11, when judged with a narrow-band circuit based on the 1st judging standard table.

[0057]Drawing 10 expresses the outline of the composition of the 2nd judging standard table for specifying the zone of the circuit 14. The zone of the circuit 14 which should specify this 2nd judging standard table 95 corresponding to data-delay-time t of the circuit 14 is defined. That is, when the data delay time of the circuit 14 is 500 ms or more, the zone of the circuit 14 is judged to be below 9600 bits per second ([bps]). When the data delay time of the circuit 14 is 250 ms - 500 ms, the zone of the circuit 14 is judged to be 9600 bps - 32k bps. When the data delay time of the circuit 14 is 180 ms - 250 ms, the zone of the circuit 14 is judged to be 32k bps. When the data delay time of

the circuit 14 is 180 or less ms, the zone of the circuit 14 is judged to be 64k bps.

[0058]Then, the line estimation control by the application server 11 is explained in detail.

[0059]The application server 11 in this example has CPU which is not illustrated. Based on the control program stored in predetermined memory storage, various control of the zone estimation control of a circuit etc. which were mentioned above can be performed now.

[0060]Drawing 11 expresses the outline of the contents of processing of the zone estimation control of the circuit 14 of the application server 11 in this example. If the channel between the terminals 13 is set up via the access server 12 and the circuit 14, the application server 11, RTT_1 which is RTT to the terminal 13 is computed by transmitting an echo request to the terminal 13 and receiving the echo response from the terminal 13 corresponding to this (Step S100). Then, based on the counter value arranged from the terminal 13 to the echo response, estimation processing E_1 which presumes that the number of routers from the application server 11 to the access server 12 mentioned above is performed (Step S101). And in response to the processing result of estimation processing E_1, the echo request to which the initial value of the counter value was set is transmitted so that an echo response may be replied with the access server 12, and RTT_2 which is RTT to the access server 12 is computed shortly (Step S102).

[0061]By the way, depending on the composition of network N_0 - N_N, number RNof routers $_1$ of the course from the application server 11 to the terminal 13 may differ from number RNof routers $_2$ of the course from the terminal 13 to the application server 11. At estimation processing E_1, since number RNof routers $_2$ of the course from the terminal 13 to the application server 11 was presumed, by estimation processing E_2, it is judged whether this presumption was right (Step S103).

[0062]As a result, since data-delay-time t of the circuit 14 is computed, based on the 1st and 2nd judging standard tables continuously shown in drawing 9 and drawing 10, estimation processing E_3 which judges the zone of the circuit 14 is performed (Step S104).

[0063]Hereafter, each processing of the application server 11 shown in drawing 11 is explained concretely.

[0064]Drawing 12 expresses the outline of the contents of processing of the RTT_1 calculation processing shown in drawing 11. The application server 11 supervises that the connection request packet which requires setting out of the channel from the terminal 13 explained by drawing 4 in the packet treating part 81 is received via

network IF80 (step S110:N), When this is detected (step S110:Y) and connection of the channel between the terminals 13 is recognized, the network connection treating part 82 generates a connection recognition packet (Step S111). As for the connection recognition packet, the data which the address of the application server 11 and the terminal 13 shows connection recognition at IP data field is arranged in the transmission source address and the destination address, respectively. The counter value canceled to such an extent that it does not stagnate in a network by a certain cause for a long time is arranged in the counter field. Then, this connection recognition packet is transmitted to the terminal 13 by the packet treating part 81 (Step S112).

[0065]Then, in the packet treating part 81, it waits for reception of the response packet transmitted with the terminal 13 via network IF80 corresponding to the connection recognition packet which transmitted at Step S112 (step S113:N). And when reception of this response packet is detected (step S113:Y), it is judged as that to which the channel between the terminals 13 was set, and the echo treating part 83 generates an echo request continuously, and this is transmitted to the terminal 13 (Step S114). An echo request arranges the data in which it is shown by the control message of ICMP that it is an echo request to the address of the terminal 13, and a transmission source address in a destination address at the address of the application server 11, and IP data field. The counter value canceled to such an extent that it does not stagnate in a network by a certain cause for a long time is arranged in the counter field.

[0066]Then, it waits to receive the echo response transmitted with the terminal 13 corresponding to the echo request which transmitted at Step S114 (step S115:N). And when reception of this echo response is detected (step S115:Y), by the RTT calculation processing part 84. RTT_1 which is RTT from the time which transmitted the echo request at Step S114, and the time which received the echo response at Step S115 to the terminal 13 is computed (Step S116). RTT_1 to the terminal 13 is computed according to the following (2) types.

[0067]

RTT_1= (echo response receipt time) -(echo request transmission time)... (2)

[0068]Drawing 13 expresses the outline of the contents of processing of estimation processing E_1 shown in drawing 11. The estimating part 85 of the application server 11 acquires the counter value of the counter field from the echo request first received by the packet treating part 81. After an initial value is set up to such an extent that the terminal 13 which received the echo request did not stagnate in the network by a certain cause for a long time, this counter value is subtracted whenever it passes the access server 12 and the 1st - the Nth router $10_{the\ 1}$ - 10_N. Since the number of routers

which usually passes through this counter field between the terminal 13 and the application server 11 is 30 or less, as for the counter field, 5 bits or more are assigned. Therefore, to the initial value of a counter value, the initial value set up at the terminal 13 can be presumed by using numerical values which are easy to guess, such as "32", "128", or "255" (Step S120). For example, when the counter value of the counter field of the echo response received by the application server 11 is "121", Since the number of routers passed between the terminal 13 and the application server 11 is usually 30 or less as mentioned above, the initial value of a counter value is judged as "128."

[0069]Then, according to the following (3) types, the number of routers to the access server 12 is computed (Step S121).

[0070]

(The number of routers) =(estimated initial value)-(counter value of echo response)-1 ... (3)

[0071]Therefore, when the counter value of the counter field of the echo response received by the application server 11 is "121", the number of routers to the access server 12 is set to "6 (=128-121-1)."

[0072]Here, since estimation processing cannot be performed when the computed number of routers is below "0" (step S122:Y), predetermined stop processing is performed that the processing itself should be stopped (Step S123). On the other hand, when the computed number of routers is not below "0" (step S122:N), it prepares for the next processing.

[0073]Drawing 14 expresses the outline of the contents of processing of the RTT_2 calculation processing shown in drawing 11. The estimating part 85 of the application server 11 makes the new echo request which set up the number of routers to the access server 12 computed at Step S121 of drawing 13 by the echo treating part 83 as a counter value of the counter field generate (Step S125). Then, this is made to transmit to terminal 13 by the packet treating part 81 (Step S126). Actually, since a counter value is subtracted "1" every by 1st [**] - Nth router 10_1-10_N and the access server 12, an echo response is replied by the access server 12.

[0074]On the other hand, the application server 11 waits to receive the echo response transmitted with the terminal 13 corresponding to the echo request which transmitted at Step S126 (step S127:N). And when reception of this echo response is detected (step S127:Y), by the RTT calculation processing part 84. RTT_2 which is RTT from the time which transmitted the echo request at Step S126, and the time which received the echo response at Step S127 to the access server 12 is computed (Step S128). RTT_2 to the access server 12 as well as (2) types is computed.

[0075]Drawing 15 expresses the outline of the contents of processing of estimation processing E_2 shown in drawing 11. As mentioned above, depending on the composition of network N_0 - N_N, number RNof routers $_1$ of the course from the application server 11 to the terminal 13 may differ from number RNof routers $_2$ of the course from the terminal 13 to the application server 11. Number RNof routers $_1$ of the course to the terminal 13 from the application server 11 to number RNof routers $_2$ of the course from the terminal 13 presumed by estimation processing E_1 to the application server 11 Then, when small, Since even the terminal 13 reaches, he is trying for the echo request which transmitted at Step S126 of drawing 14 to judge whether presumption of estimation processing E_1 was right by distinguishing whether the echo response received by the application server 11 is a thing from the terminal 13.

[0076]That is, the application server 11 distinguishes whether the echo response received by the packet treating part 81 via network IF80 is a thing from the terminal 13 corresponding to the echo request transmitted at Step S126 of drawing 4 (Step S130). This can be easily performed by referring to the transmission source address of the received echo response. As a result, when it was not an echo response from the terminal 13 and is distinguished (step S130:N), presumption of estimation processing E_1 judges it as a right thing, and ends processing of estimation processing E_2 (end). Thus, number RNof routers $_1$ of the course from the application server 11 to the terminal 13, When larger than number RNof routers $_2$ of the course from the terminal 13 to the application server 11, with the access server 12, it is regarded as that to which the echo response was transmitted, and processing is continued.

[0077]On the other hand, when having received the echo response from the terminal 13 is distinguished at Step S130 (step S130:Y), it is judged that presumption of estimation processing E_1 is an error, By the echo request which presumed by estimation processing E_1, divided the initial value of the counter value of the echo request of Step S126 of drawing 14 by "2", and newly set this as the counter value of the counter field. It returns to Step S126 of drawing 14 again, and RTT_2 which is RTT to the access server 12 is made to compute (Step S131).

[0078]Drawing 16 expresses the outline of the contents of processing of estimation processing E_3 shown in drawing 11. drawing 12 - drawing 15 -- having explained -- as -- a terminal -- 13 -- up to -- RTT -- it is -- RTT -- $_{one}$ -- an access server -- 12 -- up to -- RTT -- it is -- RTT -- $_{two}$ -- computing -- having -- if -- the next -- a circuit -- 14 -- data delay time -- t -- already -- having been shown -- (-- one --) -- a formula -- following -- computing (Step S135). Then, based on data-delay-time t of this circuit 14, the network composition between the application server 11 and the terminal 13 is presumed with

reference to drawing 9 and drawing 10 (Step S136). The concrete circuit band of the circuit 14 is presumed with reference to drawing 10 to be presumed that the circuit 14 connected to the terminal 13 has connected by the narrow-band circuit with reference to drawing 9 (Step S137).

[0079]Drawing 17 expresses the outline of the data transfer processing by the application server 11. If the zone of the circuit 14 is presumed as shown in drawing 16, contents data will be transmitted to terminal 13 as follows. That is, when it is presumed with reference to drawing 9 and drawing 10 that the circuit 14 connected to the terminal 13 is a narrow-band circuit (step S140:Y), it is set as the circuit band pinpointed with reference to drawing 10, and the contents data by which the acquisition request was carried out from the terminal 13 is transmitted (Step S141). On the other hand, when it is presumed at Step S140 that the circuit 14 connected to the terminal 13 is not a narrow-band circuit (step S140:N), it is set as the maximum band decided beforehand, and the contents data by which the acquisition request was carried out from the terminal 13 is transmitted (Step S142).

[0080]Next, operation of the network system in this example of composition of having explained until now is explained.

[0081]Drawing 18 expresses the outline of operation of the network system in this example. Here, paying attention to the packet data transmitted and received between the terminal 13, the access server 12, and the application server 11, the operating sequence of the network system in this example is shown by setting a time-axis as a vertical axis. The circuit 14 between the terminal 13 and the access server 12, When should already be set up and the terminal 13 which has a browser function, for example tends to acquire and peruse the contents data stored in the application server 11, the terminal 13 transmits a connection request to the application server 11 first (connection request 150). This connection request is making the IP-packet-data composition shown to drawing 2 that drawing 4 explained. Namely, via the access server 12 accommodated in the Internet constituted by network N_0 - N_N, IP packet data are transmitted to the application server 11 specified in the address arranged in the destination address of IP packet data. The application server 11 replies the connection recognition 151, when it will have recognized it to be the terminal in which it distinguishes and connection is permitted whether the connection contract is carried out about the terminal 13 which is a transmitting agency, if the connection request 150 from the terminal 13 is received. The terminal 13 replies the response 152 to the application server 11 in order to report that connection recognition was received.

[0082]Then, the application server 11 transmits the 1st echo request 153 to terminal 13,

in order that the terminal 13 may presume the zone of the circuit 14 connected with the access server 12. The initial value of the grade which does not stagnate in a network for a long period of time without the counter value of the counter field of this 1st echo request 153 reaching the terminal 13, and reaching the terminal 13 by a certain cause is set up. The terminal 13 will reply the 1st echo response 154 that substituted for the destination address the address of the application server 11 given to the transmission source address, if the 1st echo request 153 is received. Although assigned by several bits, he is trying for the number of routers passed between the terminal 13 and the application server 11 to usually set the numerical value which was mentioned above and which is easy to presume from it being 30 or less as an initial value of a counter value to the counter field of the 1st echo response 154.

[0083]From the terminal 13, if such 1st echo response 154 is transmitted, Whenever it passes the 1st - the Nth router $10_{the\ 1}$ in the access server 12 and network N_0 - N_N - 10_N, The counter value of the counter field of the 1st echo response 154 is subtracted "1" every, and reaches the application server 11 specified as the destination address. In the application server 11, from the transmitting time of the 1st echo request 153 to the time of reception of the 1st echo response 154 can be clocked, and it can measure now as round-Trip Time RTT_1.

[0084]The application server 11 presumes the initial value of the counter value substituted for the terminal 13 from the counter value of the counter field of the 1st received echo response 154 while measuring RTT_1. For example, when the counter value of the 1st echo response 154 is "121", the number of routers passed between the terminal 13 and the application server 11 is generally 30 or less, and since the initial value which is easy to presume is substituted, it is presumed to be "128." Therefore, it is presumed that the number of routers to the access server 12 is "6" according to (3) types (estimation processing $E_1$155).

[0085]And the application server 11 transmits the 2nd echo request 156 for this presumed number of routers "6" to terminal 13 as an initial value of the counter value of the counter field. Since it is subtracted "1" every whenever it passes the router in network N_0 - N_N, if presumption is right, a counter value will be set to "0" with the access server 12, and this counter value is replied with the purport that the 2nd echo request 156 was discarded as the 2nd echo response 157. In the application server 11, round-Trip Time RTT_2 when this 2nd echo response 157 is received is measured.

[0086]As mentioned above, it may differ from the number of routers of the course from the application server 11 to the terminal 13, and the number of routers of the course from the terminal 13 to the application server 11. Then, in the application server 11,

when the 2nd echo response is received from the terminal 13. It is judged that the number of routers to the access server 12 computed by estimation processing E_1 is an error, The echo request which assigned the value which divided the initial value of the counter value of the 2nd echo request 156 by "2" to the counter value of the counter field is transmitted, and round-Trip Time RTT_2 is measured. On the other hand, in the application server 11, when the 2nd received echo response is not a thing from the terminal 13, the number of routers to the access server 12 computed by estimation processing E_1 is judged to be the right thing (estimation processing $E_2$158).

[0087]Next, from RTT_1 and RTT_2 which were measured, the application server 11 computes data-delay-time t of the circuit 14 according to (1) type, and refers to the 1st judging standard table shown in drawing 9, The network composition between the application server 11 and the terminal 13 is presumed. When the terminal 13 is judged here to be what is connected with the narrow-band circuit, with reference to the 2nd judging standard table shown in drawing 10, the zone of the circuit 14 is presumed from computed data-delay-time t (estimation processing $E_3$159).

[0088]The application server 11 transmits the contents data stored in an inside to terminal 13 according to the circuit band presumed from the 2nd judging standard table shown in drawing 10, when it judges with the circuit to which the terminal 13 is connected as mentioned above being a narrow-band circuit. On the other hand, when it judges with the circuit to which the terminal 13 is connected being a broadband circuit, the contents data stored in an inside in the maximum band is transmitted to terminal 13 (contents data 160_1, 160_2, ...).

[0089]As explained until now, the network system in this example, To the application server 11 accommodated in the Internet by which interconnection was carried out, network N_0 - N_N by $10_{[\text{ from the 1st - the Nth router 10the 1] N.}}$ When the terminal 13 acquires contents data via the circuit 14 connected to the access server 12, While transmitting the 1st echo request from the application server 11 to the terminal 13, receiving the 1st echo response replied corresponding to this and measuring round-Trip Time RTT_1 to the terminal 13, With the counter value of the counter field subtracted "1" every whenever it is arranged at an echo request and passes a router, the number of routers between the application server 11 and the access server 12 was presumed. And using this presumed number of routers, the 2nd echo request is transmitted so that it may send a reply with the access server 12 shortly, the 2nd echo response replied corresponding to this is received, and round-Trip Time RTT_2 to the access server 12 is measured. By this, data-delay-time t of the circuit 14 becomes clear, and he presumes the circuit band of the circuit 14 corresponding to this, and is trying to supply the contents data stored

beforehand to terminal 13. Transmission of various service information is attained from an application server so that service can be comfortably received by the terminal side which receives service provision, without not notifying initial entries, such as a zone of the circuit 14, from the terminal 13, and moreover correcting the mounted state of the terminal 13 by this. It is easily applicable to the existing Internet system.

[0090]In the network system in this example, it is not limited to the connecting relation of network N_0 - N_N.

[0091]In the network system in this example, although the connection processing between the terminal 13 and the application server 11 was explained as what is performed with the 3 direction hand shake, it is not limited to this. The connection recognition packet of the application server [as opposed to / when performed by the 3 direction hand shake / the connection request packet from the terminal 13] 11, It is considered as an echo request and it is also still more possible to process the response packet from the terminal 13 to the application server 11 as an echo response. In this case, since the packet transmitted and received in a network can be reduced, improvement in a throughput can be aimed at.

[0092]Although "large" of time to become a judging standard and "smallness" are judged bordering on 100 ms in the 1st judging standard table further shown in drawing 9 of the network system in this example, it is not limited to this. For example, it is a value which may border on 90 ms and should be appropriately chosen according to the composition of a network system.

[0093]Although the 2nd judging standard table shown in drawing 10 of the network system in this example showed the time of the packet size of an echo request being around 100 bytes, it is not limited to this. The boundary line of data-delay-time t should be proportionally changed suitably according to the size of a packet size. What is necessary is just to enlarge a packet size, in order to raise the accuracy of round-Trip Time measured in order to raise presumed accuracy, when presuming a broadband circuit.

[0094]Further, with the network system in this example, when judged with it being estimation processing E_2 and presumption of estimation processing E_1 being an error, it explained as what divides the initial value of the counter value of an echo request by "2", but it is not limited to this. It may be made to assign the value which carried out the multiplication of the n (however, $0< n<1$) chosen so that estimation precision might be raised to the initial value of the counter value of an echo request.

[0095]With the network system in this example, the 2nd echo response may not be received by the network congestion state etc. at an application server further again. In

this case, since RTT_1 is generally larger than RTT_2, the application server 11 regards it as timeout, when the 2nd echo response is not received after [after transmitting the 2nd echo request] RTT1 progress, and it may be made to process estimation processing E_2.

[0096]Although he is trying to judge whether presumption by estimation processing E_1 was right by estimation processing E_2 in the network system in this example, it is not limited to this. By for example, the 2nd echo request that substituted for estimation processing E_1 the initial value which divided the number of routers to the access server 12 which measured round-Trip Time RTT_1 and was presumed by "2" as it was. By measuring round-Trip Time RTT_2, estimation processing E_2 is omissible. in this case, the transmission band of network N_0 - N_N is markedly alike as compared with the zone of the circuit 14, when large, it is useful, and the processing load of the application server 11 can be reduced, and it can presume in accuracy comparable as this example.

[0097]

[Effect of the Invention]It is not necessary to notify initial entries, such as a zone of a channel, from a terminal, and as explained above, according to the invention according to claim 1, transmission of various service information is attained from an application server so that service can be comfortably received by the terminal side which receives service provision.

[0098]According to the invention according to claim 2, to the effect of the invention according to claim 1 In addition, the 2nd device and the 1st round-Trip Time to a terminal, From the 2nd round-Trip Time to the 2nd device and 1st device. Compute the data delay time of a channel and the channel zone memory measure the zone of the channel was beforehand remembered to be corresponding to the data delay time of a channel is established, since the 2nd device transmitted data to the terminal according to the zone of the channel memorized corresponding to the computed data delay time -- the effect of the invention according to claim 1 -- in addition, it can be simple, and presumption of the zone of the channel connected to a terminal can be boiled comparatively, and can be performed now with sufficient accuracy.

[0099]Furthermore, according to the invention according to claim 3, it can apply to a system like the existing Internet system easily, without correcting the mounted state of a terminal, since the zone of the channel connected to a terminal by the echo request and an echo response was presumed.

[0100]According to the invention according to claim 4, further again in an application server. When it is made to distinguish and it is distinguished that it is a thing from a terminal, whether the 2nd echo response is a thing from a terminal, Since there are few

routers of the course from an application server to a terminal than the number of routers of the course from a terminal to an application server, The presumed number of routers judges it as an error, measures the 2nd round-Trip Time again by the 2nd echo request set as the initial value of a counter value in the smaller value by the resending control means, and the estimation precision of the zone of the channel connected to the terminal judged eventually is raised.

[0101]Furthermore, according to the invention according to claim 5, processing of an application server is simplified, and when the circuit which network congestion tends to generate is a narrow-band, while performing efficient data transfer, when a circuit is a broadband, data can be received comfortably also for a terminal.

[0102]When connection processing which sets up a channel before transmitting data from an application server to a terminal is performed by the 3 direction hand shake further again according to the invention according to claim 6, By making the connection recognition packet of the application server to the connection request from a terminal into the 1st echo request, and processing the response to an application server from a terminal as the 1st echo response further, Since the packet transmitted and received in a network can be reduced, improvement in a throughput can be aimed at.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a lineblock diagram showing the outline of the composition of the network system in one example of this invention.

[Drawing 2]It is an explanatory view showing the outline of the composition of the data transmitted and received in the network in this example.

[Drawing 3]It is a block diagram showing the composition important section of the terminal concerning the zone estimation control of the circuit in this example.

[Drawing 4]It is a flow chart showing the outline of the channel connection processing between the application servers of the terminal in this example.

[Drawing 5]It is a flow chart showing the outline of the echo processing between the application servers of the terminal in this example.

[Drawing 6]It is a block diagram showing the composition important section of the access server concerning the zone estimation control of the circuit in this example.

[Drawing 7]It is a flow chart showing the outline of the packet relay processing of the access server in this example.

[Drawing 8]It is a block diagram showing the composition important section of the

application server concerning the zone estimation control of the circuit in this example.

[Drawing 9]It is an explanatory view showing the outline of the composition of the 1st judging standard table in this example.

[Drawing 10]It is an explanatory view showing the outline of the composition of the 2nd judging standard table in this example.

[Drawing 11]It is a flow chart showing the outline of the contents of processing of the zone estimation control of the circuit of the application server in this example.

[Drawing 12]It is a flow chart showing the outline of the contents of processing of the RTT_1 calculation processing in this example.

[Drawing 13]It is a flow chart showing the outline of the contents of processing of estimation processing E_1 in this example.

[Drawing 14]It is a flow chart showing the outline of the contents of processing of the RTT_2 calculation processing in this example.

[Drawing 15]It is a flow chart showing the outline of the contents of processing of estimation processing E_2 in this example.

[Drawing 16]It is a flow chart showing the outline of the contents of processing of estimation processing E_3 in this example.

[Drawing 17]It is a flow chart showing the outline of the data transfer processing by the application server in this example.

[Drawing 18]It is a sequence diagram showing the outline of operation of the network system in this example.

[Description of Notations]

10_1 - 10_N the 1 - the Nth router

11 Application server

12 Access server

13 Terminal

14 Circuit
